MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

BMP2014 – MATHEMATICAL PROGRAMMING

(All sections / Groups)

12 OCTOBER 2017
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FOUR (4)** printed pages including cover page.
2. Answer **ALL FOUR (4)** questions.
3. Please write all your answers in the Answer Booklet provided.

QUESTION 1 (25 MARKS)

(a) The ABC insurance company is introducing two new product lines: critical illness and properties insurance. The critical illness insurance is charged at $15 per unit and $20 per unit on properties. The company wishes to establish the sales by maximize the total expected profit. The work requirements are as follows:

Department	Work hours per unit		Work hours available
	Special risk	Mortgage	
Actuarial	6	4	4800
Human Resources	0	4	3200
Investment	3	0	1800

Formulate the Linear Programming for ABC insurance company and apply **the graphical method** to solve the model. Use the corner points method to verify and interpret your optimal solution.

(13 marks)

(b) Solve the model below using **Dual simplex method**:

$$\text{Minimize } C = 7x_1 + 2x_2 + 5x_3 + 4x_4$$
$$\text{Subject to:}$$
$$2x_1 + 4x_2 + 7x_3 + x_4 \geq 5$$
$$8x_1 + 4x_2 + 6x_3 + 4x_4 \geq 8$$
$$3x_1 + 8x_2 + x_3 + 4x_4 \geq 4$$
$$x_1, x_2, x_3, x_4 \geq 0$$

(12 marks)

QUESTION 2 (25 MARKS)

State an optimal solution using **Two Phase simplex method** for the following Linear Programming problem:

$$\text{Minimize } C = 2x_1 - 4x_2 + 3x_3$$
$$\text{Subject to:}$$
$$5x_1 - 6x_2 + 2x_3 \geq 5$$
$$-x_1 + 3x_2 + 5x_3 \geq 8$$
$$2x_1 + 5x_2 - 4x_3 \leq 4$$
$$x_1, x_2, x_3 \geq 0$$

Continued...

QUESTION 3 (25 MARKS)

(a) Determine whether the function f below is convex, concave or neither with a given set S:

$$f(x_1, x_2, x_3) = 3x_1^2 + 2x_2^2 + 2x_3^2 + 2x_1x_2 + 2x_2x_3, \quad S = \Re^3$$

(7 marks)

(b) Find the optimal solution to the following problem **using Gradient Search:**

$$\text{Maximize} \quad Z = f(x_1, x_2) = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$$

with $x_0 = (1, 1)$ and $\varepsilon = 0.5$.

(18 marks)

QUESTION 4 (25 MARKS)

(a) Normah Company has four technicians to be assigned to repair four machines for the clients. The cost of each technician repairing the machine is summarized in the table below:

Technician	Machine (RM)			
	E	F	G	H
Aru	24	18	27	23
Baizura	20	19	21	17
Kelvin	29	17	16	21
Din	13	18	17	19

Find the optimal assignment that will minimize the total cost. What is the total minimum assignment cost for Normah Company?

(6 marks)

Continued...

(b) A furniture company is supplying a new type of computer tables from four factories to three warehouses. The transportation cost per unit in MYR from each factory to each warehouse is shown in the following tables:

Factory	**Warehouse**			**Factory Capacity**
	A	**B**	**C**	
W	12	10	6	500
X	4	15	3	700
Y	9	7	5	400
Z	11	8	6	700
Warehouse Demands	900	600	800	

Obtain a basic feasible solution using Minimum Cost method. Then, apply the transportation Simplex method to find the least-cost distribution system.

(19 marks)

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